

CLAIMS:

1. A microbial preparation comprising harvested microbes which have been grown or cultured in a media based on or containing resistant starch in a manner such that when subsequently incorporated in a product, the
 5 survival/recovery rate of the harvested microbes is increased as compared with the same microbes grown or cultured in a media without resistant starch.
2. The microbial preparation according to claim 1 wherein the product is selected from the group consisting of a food, feed, nutraceutical,
 10 pharmaceutical, biocontrol, and bioremediation product.
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- Sub a1*
3. The microbial preparation according to claim 1 or 2 further including resistant starch.
4. The microbial preparation according to any one of claims 1 to 3 wherein the resistant starch is type RS1, RS2, RS3 or RS4.
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- 15 5. The microbial preparation according to claim 4 wherein the resistant starch is derived from starch selected from the group consisting of maize, rice, barley, wheat, legumes, potatoes, and bananas.
6. The microbial preparation according to claim 5 wherein the resistant starch is derived from a starch having an amylose content of at least 40%
 20 (w/w).
7. The microbial preparation according to claim 6 wherein the resistant starch is derived from maize starch.
8. The microbial preparation according to claim 7 wherein the maize starch having an amylose content of at least 70% (w/w).
- 25 9. The microbial preparation according to claim 7 wherein the maize starch having an amylose content of at least 80% (w/w).
10. The microbial preparation according to claim 7 wherein the maize starch having an amylose content of at least 90% (w/w).
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- Sub a2/30*
11. The microbial preparation according to any one of claims 5 to 10 wherein the starch is chemically, physically, and/or enzymically treated or modified.
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12. The microbial preparation according to claim 11 wherein the chemical modification is selected from the group consisting of oxidation, cross-bonding, etherification, esterification, acidification, dextrinisation, and mixtures thereof.
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13. The microbial preparation according to claim 11 wherein the physical treatment is heat-moisture treatment to enhance or increase the resistant starch content of the starch.
14. The microbial preparation according to claim 11 wherein the treatment
5 is by solvent extraction to remove fats and/or minerals from the starch.
- Sub A3*
15. The microbial preparation according to any one of claims 1 to 14 wherein in use the microbes are substantially unaffected by stresses including aeration, shear, freeze drying, freezing, drying including high, medium and low water activity, elevated temperatures, low temperatures, 10 pressure and pressure fluctuations, low pH, high pH, bile acids, moisture, high osmolarity, low osmolarity, high salt, or combinations thereof.
16. The microbial preparation according to any one of claims 1 to 15 being a probiotic, a starter culture, a biocontrol or bioremediation product.
17. The microbial preparation according to claim 16 wherein the microbes
15 are probiotic microorganisms from the genera selected from the group of consisting of *Saccharomyces*, *Bifidobacterium*, *Bacteroides*, *Clostridium*, *Fusobacterium*, *Propionibacterium*, *Streptococcus*, *Enterococcus*, *Lactococcus*, *Staphylococcus*, *Peptostreptococcus*, and *Lactobacillus*.
18. The microbial preparation according to claim 16 wherein the microbes
20 are starter cultures selected from the group consisting of lactic acid bacteria including lactobacillus, lactococcus and streptococcus, leuconostoc, and yeasts.
19. The microbial preparation according to claim 16 wherein the microbes are suitable for use in biocontrol or bioremediation being selected from the
25 group consisting of bifidobacteria, acidophilus, fungi, *Bacillus* species, pseudomonads and Alcaligenes.
20. A process of preparing a microbial preparation having an increased survival/recovery rate in a product, the process comprising growing or culturing microbes in a media based on or containing resistant starch in a manner such that when subsequently incorporated in a product the
30 survival/recovery rate of the harvested microbes is increased as compared with the same microbes grown or cultured in a media without resistant starch, and harvesting the cultured microbes having an increased survival/recovery rate.

21. The process according to claim 20 wherein the product is selected from the group consisting of a food, feed, nutraceutical, pharmaceutical, biocontrol, and bioremediation product.

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22. The process according to claim 20 or 21 wherein the resistant starch is type RS1, RS2, RS3 or RS4.

23. The process according to claim 22 wherein the resistant starch is derived from starch selected from the group consisting of maize, rice, barley, wheat, legumes, potatoes, and bananas.

24. The process according to claim 23 wherein the resistant starch is 10 derived from a starch having an amylose content of at least 40% (w/w).

25. The process according to claim 24 wherein the resistant starch is derived from maize starch.

26. The process according to claim 25 wherein the maize starch having an amylose content of at least 70% (w/w).

15 27. The process according to claim 25 wherein the maize starch having an amylose content of at least 80% (w/w).

28. The process according to claim 25 wherein the maize starch having an amylose content of at least 90% (w/w).

29. The process according to any one of claims 23 to 28 wherein the starch is chemically, physically, and/or enzymically treated or modified.

30. The process according to claim 29 wherein the chemical modification is selected from the group consisting of oxidation, cross-bonding, etherification, esterification, acidification, dextrinisation, and mixtures thereof.

25 31. The process according to claim 29 wherein the physical treatment is heat-moisture treatment to enhance or increase the resistant starch content of the starch.

32. The process according to claim 29 wherein the treatment is by solvent extraction to remove fats and/or minerals from the starch.

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33. The process according to any one of claims 20 to 32 wherein the resistant starch is used in the media at a concentration of 0.01 to 10% (w/w).

34. The process according to claim 33 wherein the resistant starch is used in the media at 0.1 to 5% (w/w).

35. The process according to claim 33 wherein the resistant starch is used 35 in the media at 1% (w/w).

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36. The process according to any one of claims 20 to 35 wherein in use the microbes are unaffected by stresses including aeration, sheer, freeze drying, freezing, drying including high, medium and low water activity, elevated temperatures, low temperatures, pressure and pressure fluctuations, low pH, high pH, bile acids, moisture, high osmolarity, low osmolarity, high salt, or combinations thereof.
- 5 37. The process according to any one of claims 20 to 36 wherein the microbial preparation is a probiotic, a starter culture, a biocontrol or bioremediation product.
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- 10 38. The process according to claim 37 wherein the microbes are probiotic microorganisms from the genera selected from the group of consisting of *Saccharomyces*, *Bifidobacterium*, *Bacteroides*, *Clostridium*, *Fusobacterium*, *Propionibacterium*, *Streptococcus*, *Enterococcus*, *Lactococcus*, *Staphylococcus*, *Peptostreptococcus*, and *Lactobacillus*.
- 15 39. The process according to claim 37 wherein the microbes are starter cultures selected from the group consisting of lactic acid bacteria lactic acid bacteria including lactobacillus, lactococcus and streptococcus, leuconostoc, and yeasts.
- 20 40. The process according to claim 37 wherein the microbes are suitable for use in biocontrol or bioremediation being selected from the group consisting of bifidobacteria, acidophilus, fungi, *Bacillus* species, pseudomonads and *Alcaligenes*.
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- 25 41. A microbial preparation having an increased survival/recovery rate in a product prepared by the process according to any one of claims 20 to 40.
42. A product containing microbes having an increased survival/recovery rate, the product including a microbial preparation according to any one of claims 1 to 19 or 41.
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- 30 43. The product according to claim 42 selected from the group consisting of a food, feed, nutraceutical, pharmaceutical, biocontrol, and bioremediation product.
44. The product according to claim 43 being a food, feed, nutraceutical or pharmaceutical product selected form the group consisting of fluid-based food products, water-based fluids, cereal and plant-based food products, solid-based food products, tablets, food additives, health supplements, and pharmaceutical preparations.

45. The product according to claim 44 wherein the fluid-based food products include milk-based products where the edible ingredient is one or more milk-based ingredients including whole milk, milk solids, milk fat, cream, non-fat dried milk, any other component or derivative from milk suitable for use in milk-based products.
46. The product according to claim 44 wherein the solid-based food products include snack bars, breakfast cereals, bread, confectionary, extruded food products, muesli bars, buns, biscuits, feed pellets, and coated food products.
47. The product according to claim 43 being a food product suitable to contain and deliver probiotic microorganisms.
48. The food product according to claim 47 selected from the group consisting of food stuffs, fruit beverages, water ices, confectionary, coatings or covertures, yoghurts, yoghurt drinks, unfermented drinks, flavoured milk drinks, modified milk drinks, ice-creams, and dairy desserts.
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49. The product according to any one of claims 42 to 48 further including resistant starch.
50. The product according to claim 49 wherein the resistant starch is type RS1, RS2, RS3 or RS4.
51. The product according to claim 50 wherein the resistant starch is derived from starch selected from the group consisting of maize, rice, barley, wheat, legumes, potatoes, and bananas.
52. The product according to claim 51 wherein the resistant starch is derived from a starch having an amylose content of at least 40% (w/w).
53. The product according to claim 51 wherein the resistant starch is derived from maize starch.
54. The product according to claim 53 wherein the maize starch having an amylose content of at least 70% (w/w).
55. The product according to claim 53 wherein the high amylose starch is maize starch having an amylose content of at least 80% (w/w).
56. The product according to claim 53 wherein the high amylose starch is maize starch having an amylose content of at least 90% (w/w).
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57. The product according to any one of claims 51 to 56 wherein the starch is chemically, physically, and/or enzymically treated or modified.
58. The product according to claim 57 wherein the chemical modification is selected from the group consisting of oxidation, cross-bonding,

etherification, esterification, acidification, dextrinisation, and mixtures thereof.

59. The product according to claim 57 wherein the physical treatment is heat-moisture treatment to enhance or increase the resistant starch content of the starch.

60. The product according to claim 57 wherein the treatment is by solvent extraction to remove fats and/or minerals from the starch.

Surell 61. The product according to any one of claims 49 to 60 wherein the resistant starch is added at a concentration of 0.1 to 90% (w/w) total product.

10 62. The product according to claim 61 wherein the resistant starch is used at 1 to 10% (w/w).

63. Use of resistant starch in a microbial culture media to produce microbes which when used subsequently in a product after being harvested from the media, have an increased survival/recovery rate as compared with the same microbes grown or cultured in a media without resistant starch.

15 64. The use according to claim 63 wherein the product is selected from the group consisting of a food, feed, nutraceutical, pharmaceutical, biocontrol, and bioremediation product.

65. The use according to claim 64 wherein the resistant starch is type RS1, 20 RS2, RS3 or RS4.

66. The use according to claim 65 wherein the resistant starch is derived from starch selected from the group consisting of maize, rice, barley, wheat, legumes, potatoes, and bananas.

25 67. The use according to claim 66 wherein the resistant starch is derived from a starch having an amylose content of at least 40% (w/w).

68. The use according to claim 67 wherein the resistant starch is derived from maize starch.

69. The use according to claim 68 wherein the maize starch having an amylose content of at least 70% (w/w).

30 70. The use according to claim 68 wherein the maize starch having an amylose content of at least 80% (w/w).

71. The use according to claim 68 wherein the maize starch having an amylose content of at least 90% (w/w).

72. The use according to any one of claims 66 to 71 wherein the starch is chemically, physically, and/or enzymically treated or modified.

73. The use according to claim 72 wherein the chemical modification is selected from the group consisting of oxidation, cross-bonding, etherification, esterification, acidification, dextrinisation, and mixtures thereof.

74. The use according to claim 72 wherein the physical treatment is heat-moisture treatment to enhance or increase the resistant starch content of the starch.

75. The use according to claim 72 wherein the treatment is by solvent extraction to remove fats and/or minerals from the starch.

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